Canada's National Implementation Strategy on Climate Change

OCTOBER 2000

National Climate Change Process

ISBN: 1-894686-47-0
This document is also available at **www.nccp.ca**

Ce document est également offert en français sous le titre :
Stratégie nationale de mise en œuvre du Canada sur le changement climatique

103-07113/

CANADA'S NATIONAL IMPLEMENTATION STRATEGY ON CLIMATE CHANGE

October 2000

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Preface

This National Implementation Strategy is part of a coordinated national response to climate change. Federal, provincial and territorial governments will implement this broad strategy through individual and joint actions, the first series of which are outlined in the First National Business Plan (2000/01-2002/03). These governments will communicate results in progress reports and detail new actions in annually updated three-year business plans.

This approach was developed from the National Climate Change Process (National Process), which was established by the federal, provincial and territorial ministers responsible for energy and the environment in response to the 1997 direction by the First Ministers of the federal, provincial and territorial governments of Canada.

International Context

In 1992, Canada signed the *United Nations Framework Convention on Climate Change* (UNFCCC or the Convention). The Convention set the objective of stabilizing greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. The parties to the Convention judged that initial efforts were not sufficient and, in 1997, they negotiated the Kyoto Protocol (Protocol), which, if it comes into force, would set binding emissions targets for developed countries for the five-year period of 2008 to 2012. Canada's commitment would require reductions to 6 percent below the level recorded in 1990. These reduction obligations may be met, in part, by acquiring credits for reductions made in other countries under the Kyoto Mechanism provisions. Since 1997, negotiations have continued to further define the rules and guidelines under the Protocol, and to set the framework for decisions by Parties on ratification.

National Process

Immediately after the negotiation of the Kyoto Protocol, Canada's First Ministers recognized the importance of climate change and agreed that Canada must do its part to address the issue. The First Ministers agreed, as a guiding principle, that no region should bear an unreasonable burden from implementing the Protocol.

The First Ministers directed the federal, provincial and territorial energy and environment ministers to examine the impacts, costs and benefits of implementing the Kyoto Protocol, as well as the options for addressing climate change. In the spring of 1998, the Energy and Environment Ministers responded by establishing an inclusive and collaborative National Climate Change Process.

The National Process established 16 Issue Tables/Working Groups involving 450 experts from industry, academia, non-governmental organizations and government. The Issue Tables reviewed seven key sectors of the economy and eight cross-cutting strategies. An analysis and modelling group integrated the results into a

comprehensive preliminary analysis of the implications of options for meeting the Kyoto target. No other country has adopted such an open, inclusive and comprehensive process.

The National Process developed results along two tracks: policy and analysis. The result has been a comprehensive information base of reports on costs and opportunities, background analyses, technological opportunities, modelling, and recommendations for action.

Among other issues, the National Process identified:

- the continued growth in aggregate emissions in all Canadian regions;
- the huge diversity of climate-related activities under way in all sectors of the economy, and the resulting progress in reducing energy and carbon intensity in almost every Canadian sector;
- opportunities for immediate actions to reduce greenhouse gas emissions that have positive economic, environmental, health, social or other benefits for Canadian communities, businesses and individuals;
- stakeholder desire for greater policy direction and consistency from federal, provincial and territorial governments;
- the need for further clarification of international rules and agreements on climate change and Canadian opportunities and costs; and
- the need for further scientific, impact, adaptation, economic and other analyses to inform decision-making by federal, provincial and territorial governments.

Coordinated National Approach

In 2000, building on the work of the National Process and acknowledging the considerable contributions of the Issue Tables the Energy and Environment Ministers moved forward a coordinated national approach to climate change that includes:

- the National Implementation Strategy; and
- the First National Business Plan, which organizes individual and cooperative action under the key themes of Phase One of the Strategy.

Overview

Canada's federal, provincial and territorial governments view climate change as a priority issue. They are committed to managing the risks of climate change by taking individual and joint action to reduce emissions and prepare to adapt to a changing environment, and by encouraging and enabling action by all Canadians.

The National Implementation Strategy outlines a shared risk-management strategy that recognizes and respects the jurisdictional authority of federal, provincial and territorial governments.

The National Implementation Strategy involves:

- taking immediate action to reduce risks and to improve our understanding of risks associated with climate change, as well as the costs and consequences of reducing emissions and adapting to a changing environment (see First National Business Plan);
- instituting a national framework that includes individual and joint action, and recognizes jurisdictional flexibility in responding to unique needs, circumstances and opportunities;
- adopting a phased approach, which schedules future decisions and allows progressive action in response to changing domestic and international circumstances and improved knowledge;
- improving our understanding of the functioning of the climate system and the national and regional climate change impacts as they affect Canada, in order to take actions to reduce emissions and adapt to a changing environment;
- understanding the necessary relationship between international and national strategies; and
- developing our understanding of the implications of emission reduction targets and major options, including cross-cutting policy approaches such as emissions trading and allocation of responsibility for reducing emissions, before making decisions about targets or moving to the next phase of the Strategy.

The National Implementation Strategy outlines themes or priority areas for its first phase. The First National Business Plan lists objectives for each of these areas, as well as actions underway or under consideration by federal, provincial and territorial governments.

A. Canada's National Implementation Strategy on Climate Change — Framework for Action

The National Implementation Strategy is a framework for a coordinated Canadian response to climate change. It reflects a fundamental decision by federal, provincial and territorial governments to address the issue of climate change, both by reducing Canada's greenhouse gas (GHG) emissions and by developing strategies to adapt to a changing environment.

The National Implementation Strategy acknowledges that although climate change poses significant environmental, economic, health and social risks for Canadians, many uncertainties remain. Therefore, the Strategy uses a risk-management approach to balance uncertainty with the need to take action. It enables actions that reduce GHG emissions, promote the development of adaptation strategies, retain the flexibility to be responsive to scientific and international developments, and allow Canada to position itself to make the right decisions at the right time.

Under the implementation framework created for the Strategy, Canada's federal, provincial and territorial governments have agreed to develop a series of business plans outlining individual and joint actions. This will ensure that the actions taken reflect each government's priorities and decision-making processes.

Each year, the governments will update their business plans to reflect new scientific and international developments, as well as lessons from previous experiences. These updates will also include new actions.

The business plans represent an important step forward to show that Canada's federal, provincial and territorial governments are responding to climate change in a manner that is effective, timely and in keeping with Canada's international obligations. Together, the National Implementation Strategy framework and the business plans incorporate an approach that recognizes the relationship between domestic and international contexts, respects jurisdictional authorities, and allows for flexibility and cooperative action.

B. Vision

Canadians taking effective action — at home and abroad — to reduce the risks of climate change, to realize opportunities and to protect and improve our quality of life.

C. Managing the Risks of Climate Change — Risk-Management Approach

The National Implementation Strategy uses a risk-management approach that attempts to limit the risks of climate change while maximizing opportunities for Canada to contribute to global and national solutions. Risk management applies what we already know about the causes and impacts of climate change, while positioning Canada to make the right decisions as more information becomes available and uncertainties are reduced. Taking early steps to manage risks also permits progressive gains from experience as uncertainties are reduced in the short-term and as actions are implemented in the long-term.

The risk-management approach incorporates three key elements:

- improving our scientific and analytical understanding;
- coordinating national and international action; and
- implementing a phased approach.

These elements cover both adaptation and mitigation, require a connection between international and domestic contexts, and entail building public awareness and involvement in moving forward and seizing opportunities.

While there is a clear consensus that managing the risks of climate change requires a concerted effort to reduce GHG emissions and develop adaptation strategies, a number of uncertainties continue to surround the issue, including:

- the environmental, economic, health and social impacts of climate change;
- the likely effects on Canada of actions by Canada's major trading partners;
- the way outstanding issues of the Kyoto Protocol will be resolved, including the treatment of agricultural and forest carbon sinks, the participation of developing countries, and the compliance regime;
- the potential use of a cross-sectoral economic instrument such as a domestic emissions trading system; and
- the pace at which new technologies will be developed and deployed.

The Strategy's risk-management approach involves:

- taking timely, progressive action to reduce risks and adapt;
- reducing uncertainties about the timing, magnitude, probability and consequences of impacts; and
- identifying and analyzing policy options to prepare for future decision-making.

Canada's action on climate change can also have a profound bearing on our future competitive position. For example, the international focus on climate change has already created a demand for new technologies low in GHG-producing emissions. Other countries are investing aggressively in these technologies. Canada could gain a competitive advantage by specializing in climate change technologies. Alternatively,

failure to develop such technologies could place Canada at a competitive disadvantage.

i) Improving Our Scientific and Analytical Understanding

The Intergovernmental Panel on Climate Change (IPCC) has affirmed that the balance of evidence suggests there is a discernible human influence on the global climate. The IPCC projected that if GHG concentrations doubled, the average global temperature would rise between 1.0 and 3.5 degrees Celsius in this century. The impacts of climate change will be different in different sectors and regions of Canada. Probable impacts include:

- *negative impacts*, such as increases in extreme weather events such as violent storms and droughts; flooding and erosion in coastal regions; forests and farms more at risk from pests, diseases and fires; a significant rise in the number of very hot days in cities, placing children, the elderly and people with respiratory problems at greater risk; widespread changes in fishery harvests and location of fishing grounds; and

- *positive impacts,* such as warmer and longer growing seasons for agricultural products; and milder winters that may reduce the amount of energy required to heat homes and buildings.

Many of the projected negative impacts of climate change are already being seen in many areas. This is especially the case in the North where temperature increases and the impacts of these changes serve as an early warning for the rest of Canada. The overall effects of climate change on Aboriginal people with traditional lifestyles are more pronounced in the North than elsewhere, with many northern communities experiencing changes in temperature, precipitation and sea ice, which threaten animals' habitats and survival.

Despite our increasing understanding of these impacts, considerable uncertainties remain regarding the causes, magnitude and timing of climatic changes, regional and sectoral physical and socio-economic impacts, and our capacity to adapt. Key to reducing these uncertainties is a better analytical and scientific understanding of what is happening to the climate and how vulnerable we are to climatic changes. Further work needs to be done in the following areas: systematic observation and modelling of the global climate, our capacity to adapt to the impacts of climatic change, and socio-economic research on the regional and sectoral impacts of climate change and potential policy responses.

Improved understanding will better inform:

- Canada's position in international negotiations in the short term;
- an assessment of the desirable pace of international action in the long term;
- opportunities and strategies for reducing domestic emissions; and
- actions to advance adaptive capacity (i.e., opportunities to reduce negative impacts and take advantage of any positive impacts).

ii) Coordinating National and International Action

Climate change is a global challenge that requires the efforts of the whole international community for an effective response. The leadership of developed countries is important, but the long-term involvement of all countries is critical to long-term success.

The United Nations Framework Convention on Climate Change (UNFCCC) provides the context for progressive action on climate change. Canada has traditionally played an important role in global stewardship and is doing its part to address climate change.

Canada's objectives both shape, and are shaped by, international agreements and efforts. Just as an understanding of domestic priorities informs Canada's international negotiating positions, international agreements on climate change provide a framework through which Canada can meet its environmental objectives.

As we move forward, Canada needs to engage and facilitate the private sector in efforts to address climate change. Canada's international efforts must build economic and environmental linkages that aid Canadian companies that are trading and investing in other countries.

Close linkages between international negotiations and national decisions are essential if Canada is to maximize its environmental response, and do so in a way that promotes sustainable development.

Canada's international objectives are to:

- maximize Canada's ability to meet its commitments at the lowest possible cost through aggressive pursuit of market-based mechanisms, securing favourable terms for sinks and other measures;
- contribute to achievement of global climate change objectives and ensure a level playing field with Canada's competitors, by maximizing participation of key developed and developing economies in the global effort to mitigate climate change; and
- maximize opportunities for Canadian businesses in international projects and initiatives on climate change.

The UNFCCC clearly states that lack of certainty should not be a barrier to action. A number of international policy issues have yet to be resolved, including those concerning elements of the Kyoto Protocol. Our decisions must also be informed by actions by other nations, particularly our major trading partners. For example, the nature of an international trading system for emissions has yet to be determined and the design of the system is a relevant factor for making domestic decisions. A key aspect of Canada's phased approach is that as the international policy environment becomes more certain, we can take progressive action at home.

iii) Phased Approach

Canada must be in a position to make the right decisions at the right time. An effective risk-management strategy includes a sequence of planned decisions and actions that are informed by an improved understanding of science and international and domestic policy contexts.

The National Implementation Strategy therefore provides a multi-phased approach to begin sensible action now, followed by ongoing monitoring and associated "course corrections" based on new developments. The phased approach sends a clear signal from governments that they are serious about addressing the issue of climate change, while recognizing uncertainties that will have a bearing on future actions.

The National Implementation Strategy identifies various phases of progressive action in addressing climate change, based on scheduled decisions arising from domestic and international developments. It facilitates action by all orders of government by providing a strategy and framework for action in advance of any decision on ratification of the Kyoto Protocol, while moving forward the policy and analytical work that is needed to make any ratification decision.

Deciding to move forward from one phase to the next signals increasingly progressive climate change action and requires a broad intergovernmental understanding of the environmental, economic, health and social implications of Canada's international commitments. Moving forward also requires continuing analytical work in each phase to support policy decisions in that phase and to inform the next phase.

Phase One

Phase One of the National Implementation Strategy will be in force until an effective international agreement on climate change is ratified (e.g., the Kyoto Protocol or a subsequent agreement). Policy and technical analyses completed in Phase One will inform the decision to move to Phase Two.

Phase One supports actions that are the most cost-effective, while delivering important health, economic, environmental and social benefits, and laying the ground work and building momentum for further progressive action. Some actions would include opportunities that would be lost if they were not undertaken during Phase One, or that involve long lead times and require preparation in Phase One to be ready after Phase One. Phase One must engage a broad cross-section of Canadians to take action now to reduce Canada's overall emissions and reduce costs in the future.

Phase One of the National Implementation Strategy has five connected themes:

1. **Enhancing Awareness and Understanding** — Inform, educate and build awareness of the science and impacts of climate change, including the capacity to adapt, develop broad support for making climate change a priority, and encourage and motivate Canadians to take personal and corporate actions to reduce GHG emissions.

2. **Promoting Technology Development and Innovation** — Increase the availability of new technologies that help reduce GHG emissions and promote commercial opportunities, at home and abroad, for Canadian companies that are developing new technologies low in GHG-producing emissions. This includes identifying new approaches to address emission targets within, and beyond, the Kyoto time frame.

3. **Governments Leading by Example** — Governments set a positive example and send a signal to Canadians that climate change is an issue that must be addressed. Governments must get their own houses in order by increasing the energy efficiency of government-owned buildings and vehicle fleets, improving energy consumption practices, and acquiring "green" products and equipment. Governments can provide leadership by sharing "best practices" with each other, with communities and with the private sector.

4. **Investing in Knowledge and Building the Foundation** — Equip decision-makers with the knowledge, capacity and experience to make informed decisions and lay the foundation for future actions. There are four components: modelling (continue work on analysis and modelling); international (inform and support Canada's position in international negotiations); science, impacts and adaptive capacity (reduce scientific uncertainty in areas important to Canada's objectives and increase understanding of impacts as a basis for developing options to adapt to climate change); and options for future policies, such as domestic emissions trading.

5. **Encouraging Action** — Phase One focuses on seven sectors of the economy (agriculture, buildings, electricity, forestry (sinks), industry, municipalities and transportation) and on cross-sectoral strategies. Sectoral strategies catalyze immediate actions to further reduce GHG emissions and begin to develop

strategies to adapt to the effects of climate change. Cross-sectoral strategies will also build on existing approaches, and will pave the way for further significant reductions.

Details of ongoing and proposed actions to respond to climate change can be found in the annually updated three-year business plans.

Future Phases

Future phases depend on decisions about the Canadian response to climate change and the nature of international commitments. The decision to move to Phase Two is linked to greater international certainty of the ratification of the Kyoto Protocol, the actions of our major trading partners, and greater domestic clarity concerning the major policy approaches and actions required to implement an agreement. Preparation during Phase One will include the development and analysis of major options so that governments and stakeholders understand these options and their implications. For example, Phase One will include discussions and analyses of alternative approaches such as allocation and domestic emissions trading, as well as exploration of options such as sink enhancement, voluntary emissions trading and international flexibility mechanisms.

If Canada ratifies the Kyoto Protocol, Phase Two will cover the period from ratification until the beginning of the first commitment period, in 2008. It will focus on issues such as the implementation of any major economic instruments (e.g., a domestic emissions trading system) and the possible allocation of responsibility for a national emission reduction target. Similarly, Phase Three and future phases will encompass Canada's commitment period(s), and will focus on the need to make agreed-to reductions and respond to evolving domestic and international circumstances.

D. Responding to Climate Change — Mitigation and Adaptation

The National Implementation Strategy recognizes the need for timely action. It is clear that the climate is already changing; delaying action until the international regime and domestic understanding are clarified risks losing important lead times. By acting now we can avoid rising costs and increased difficulties in reducing greenhouse gas emissions later, and take advantage of emerging domestic and international markets for new climate-related products and services.

Any effective approach to dealing with climate change must incorporate two distinct responses: reducing GHG emissions (mitigation) and responding to the impacts (adaptation).

Mitigation involves direct actions within and across economic sectors to decrease the amount of greenhouse gases emitted into the atmosphere. Mitigation does not necessarily imply decreased economic growth or, conversely, that increased economic growth will correspond to higher emission levels. Instead, any effective mitigation strategy aims to alter the relationship between economic growth and GHG emissions, permitting economic growth to continue while reducing emission levels.

Mitigation efforts will build on steps already taken by federal, provincial and territorial governments, municipal governments, non-governmental organizations, and individuals to encourage innovation and market-based solutions to reduce GHG emissions. Long-term strategies include:

- reducing energy use in all sectors by changing behaviour (conservation) and investing in energy-efficient technologies and practices;
- increasing the carbon efficiency of the energy mix by investing in low-carbon and no-carbon technologies and fuels;
- capturing emissions directly for storage or use;
- sequestering carbon through biological processes; and
- reducing non-energy sources such as emissions from agriculture livestock.

Increasing our capacity to adapt reduces our vulnerability to the effects of a changing climate. Adaptation requires taking action to reduce the negative impacts of climate change throughout Canada and taking advantage of any positive impacts (e.g., warmer and longer growing seasons). Future adaptation may include water conservation measures (to adapt to reduced availability of water and changing energy supply and demand), emergency preparedness and response, and future-oriented reviews of building and land-use standards, codes and regulations.

There is no single approach that will work to adapt to changes in all regions or to mitigate greenhouse gases in all economic sectors. Just as the challenges and opportunities are different in each area, some strategies will need to be specific. These differing strategies form the basis of Canada's annually updated three-year business plans (see Section F).

E. Jurisdictional Flexibility and Coordination

Regional diversity is an important consideration in implementing a national strategy to address climate change. GHG emission levels vary significantly by province and territory, reflecting the diversity of Canada's regions in population densities, manufacturing activities and resources. Underlying the National Implementation Strategy is the recognition that jurisdictions have authority to develop specific programs and flexibility to reflect their unique circumstances. In fact, many jurisdictions have already developed their own action plans. At the same time, a

national strategy is required to provide coordination between different orders of government, as well as among governments, non-governmental organizations and the private sector.

The National Implementation Strategy and related business plans will raise public awareness, send a coordinated message to key stakeholders, help focus actions on common priorities, develop a shared analytical understanding and knowledge base, assist in preparing for key policy decisions, and aid the development and delivery of coordinated programs. At the same time, the Strategy and business plans are flexible and recognize jurisdictional authority, different regional circumstances, and the need for governments to respond to individual priorities.

Although Energy and Environment Ministers are ultimately responsible for developing individual jurisdictional responses to climate change, as well as coordinated approaches, other ministerial councils are engaged in developing climate change solutions in areas such as transportation, agriculture, forestry and industry. Close coordination among all sectoral councils, and on policy development for other air issues, will need to continue to ensure an integrated climate change strategy.

F. Annually Updated Three-year Business Plans

The Strategy proposes a series of annually updated three-year business plans to evolve as governments move forward on implementation. Each year, business plans will be monitored; updated to reflect new scientific and analytical understanding, issues and opportunities; and presented to Energy and Environment Ministers.

The first two or three business plans will likely focus on Phase One, with each consecutive business plan enhancing the actions implemented previously and adopting new actions, where appropriate.

Each annually updated three-year business plan will:

- have clear objectives;
- identify specific, concrete actions that governments and other partners (non-governmental organizations and the private sector) have committed to undertake;
- identify actions governments are considering for implementation in the three-year period, as well as those that require further work and consultation for later decision and implementation; and
- monitor and report progress publicly.

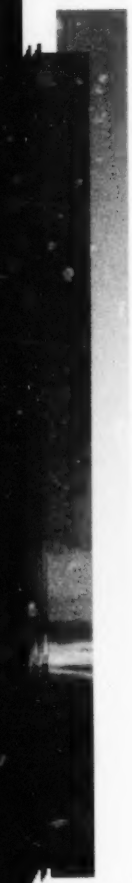
Energy and Environment Ministers will regularly:

- receive assessments of the implementation of the business plans; and
- consider and adopt the next business plan.

G. Review and Update

This National Implementation Strategy reflects agreement at Canada's joint meetings of federal, provincial, and territorial ministers responsible for energy and environment on how best to respond to climate change.

Changes to international and domestic circumstances, and progress in business plan implementation, will require periodic review of the National Implementation Strategy by Energy and Environment Ministers.



CANADA'S NATIONAL IMPLEMENTATION STRATEGY ON CLIMATE CHANGE

ANNEX 1
SCIENCE, IMPACTS and ADAPTATION

Climate change science and socio-economic research underpin Canada's ability to respond and adapt to climate change in the long term. Research and monitoring alert decision-makers to the potential impacts of climate change, which in turn informs Canadian positions in international negotiations, domestic responses to climate change and efforts to educate Canadians about climate change.

An understanding of the science of climate change provides the background and rationale for action on climate change. Action in this context refers to both *mitigation* (i.e., measures to reduce greenhouse gas emissions), and *adaptation* (measures to reduce negative impacts). The combination of mitigation and adaptation measures forms the core of an appropriate risk-management approach to climate change.

National Implementation Strategy on Climate Change — Block 1: Science, Impacts and Adaptation provides an overview of the current state of science on climate change, and outlines the potential impacts of climate change, both globally and in different regions of Canada. Nevertheless, there are areas of continued uncertainty in climate science, particularly with respect to the potential rate and nature of regional climate changes.

Background and History

The greenhouse effect refers to the natural ability of the atmosphere to insulate the Earth's surface from heat loss. More than two-thirds of the radiation from the sun passes through the clear atmosphere and is absorbed by the Earth's surface. This energy is returned to the atmosphere, absorbed and re-emitted by greenhouse gases such as water vapor, carbon dioxide, methane, and nitrous oxide. This process keeps the average global temperature of the Earth at approximately 15° Celsius - 33° warmer than if the greenhouse effect did not exist.

Land surfaces, the biosphere and oceans play an important role in the climate system by both absorbing and releasing CO_2. As such, they act as both carbon *sinks* (or reservoirs) and as *sources* of greenhouse gas emissions at different points in their cycles.

The concept of climate change, or changes in the composition of the atmosphere resulting directly or indirectly from human activity, dates back more than one hundred years. International scientific collaboration on climate change began to accelerate in the 1970s. In 1988, the United Nations Environment Program and the World Meteorological Organisation established the Intergovernmental Panel on Climate Change (IPCC) to assess scientific research on climate change, including its environmental impacts and potential remedial measures.

The IPCC, which engaged a large number of leading scientists in a range of relevant fields, has played a critical role internationally in providing a rationale for global action on climate change. The *First Assessment Report* by the IPCC, released in 1990, led to the signing of the *United Nations Framework Convention on Climate Change* in 1992. In addition, the IPCC's 1995 *Second Assessment Report*, which noted that "...the balance of evidence suggests that there is a discernible human influence on global climate," formed the impetus for the international negotiations that resulted in the signing of the Kyoto Protocol in December 1997.

Continuous improvement in our understanding of both the state of the climate system and how it works will be key to national and international decision-making in the years ahead. The IPCC's *Third Assessment Report*, due in 2001, will assess new findings regarding the scientific, technical and socio-economic implications of climate change. This report will be an important milestone in the evolution of understanding climate change.

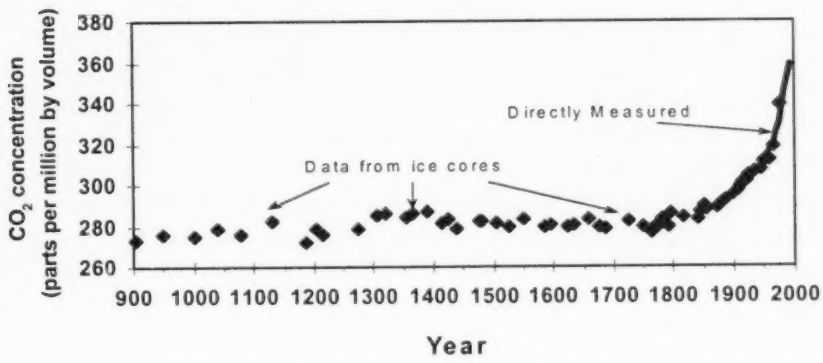
Key Scientific Findings to Date

Finding #1: **Human activities are changing the composition of the atmosphere.**

The Earth's atmosphere is constantly modified by complex interactions within the climate system. Until relatively recently, these interactions were not understood to be greatly influenced by human activities. According to data collected from polar ice cores, concentrations of CO_2 (the most prevalent greenhouse gas) were stable at approximately 280 parts per million by volume (ppmv) for the 10 000 years between the end of the last glaciation and the beginning of the 19th century.

However, it is now apparent that since the beginning of the 19th century CO_2 concentrations have increased by approximately 30%. Business-as-usual projections estimate that concentrations of CO_2 will at least double pre-industrial levels by the end of the 21st century.

Figure 1.1: Changes in carbon dioxide concentrations during the past 1000 years, based on ice core data and direct atmospheric observations



(Source: Canadian Climate Program Board)

Finding #2: **Most scientists believe that changes in atmospheric concentrations of CO_2 will affect the global climate.**

Many scientists project that these increases in atmospheric CO_2 concentrations will cause significant changes to regional and global climates and related climate indicators such as temperature, precipitation and sea level.

Sophisticated computer models are being used by the international scientific community to explore how the global climate system might respond to increased atmospheric concentrations of CO_2. Results from these models are often expressed as a doubling of CO_2, which could occur as early as the second half of the 21st century.[1]

While uncertainties remain with respect to the timing and rate of these changes, the IPCC's *Second Assessment Report* suggested that the *average global surface temperature is likely to increase by between 1 °and 3.5 °C by 2100.* Already, the rate and duration of warming in the 20th century were greater than at any other time in the past 1000 years. Large and rapid changes to the climate system have occurred in the past and are difficult to predict. However, we know that when the climate system is forced rapidly, as we are doing now, unexpected behaviour can occur.

The impacts of such changes could be significant: sea levels are projected to rise, and both the hydrological cycle and forests could undergo major changes globally. Regional increases in so-called extreme weather events such as severe storms, heat waves, floods,

[1] This doubling of CO_2 is expected to occur even if the provisions of the Kyoto Protocol are fully met by all participating countries, thereby underscoring the need for adaptation measures as part of an overall response strategy.

and drought, are also projected to result. Consequences for ecosystems and socio-economic systems may, according to the IPCC, also occur as a result of rising temperatures. Emerging scientific consensus suggests that changes will not be experienced in steady progression, but rather through changes in the intensity and frequency of natural variability in the climate system.

In assessing the impacts of climate change, it is important to consider both global and regional aspects. Because regions differ substantially in their vulnerability and their capacity to climate change and other environmental stresses, the consequences of climate change may be borne inequitably. There may be some potentially positive impacts for certain regions and sectors of the economy, such as warmer winters and extended growing seasons. However, many regions are likely to experience *adverse* effects of climate change, some of which are potentially irreversible.

Most computer models project that the greatest climatic changes will be felt in countries of high latitudes, such as Canada. The tropics are expected to experience the least change, although many tropical countries have less capacity to adapt and would thus be more vulnerable to impacts. Continents are expected to experience greater warming than oceans, and winters are expected to warm more significantly than summers. An accelerated global hydrological cycle is also projected by most models, as well as increased winter precipitation and soil moisture in high latitudes (above 60° North).

Finding #3: ***Changes consistent with these projections are already being observed.***

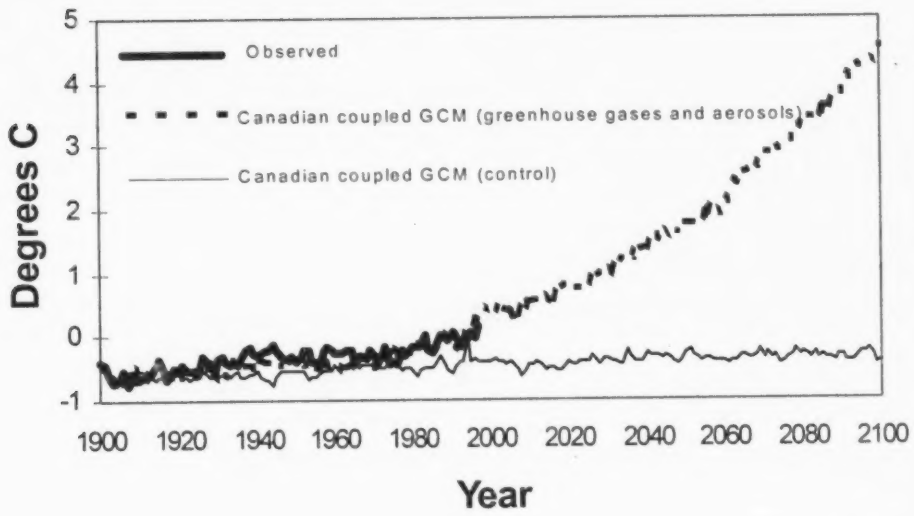
The global climate system is already changing. According to the World Meteorological Organization, the Earth's global mean surface temperature in 1998 was the highest since instrument records were introduced worldwide in 1860, and was almost 0.7°C warmer than at the end of the 19th century. In addition, seven of the 10 warmest years on record have occurred in the 1990s.

Other climate-related trends are also evident worldwide. For example, from the mid-1960s to the mid-1990s, losses from climate-related disasters increased from approximately $5 billion to $50 billion per year worldwide. This increase is partly attributable to the larger populations and infrastructure exposed to these events.

Implications for Canada

Although computer models are not specifically designed to do precise regional projections, these models suggest that a doubling of atmospheric CO_2 concentrations could rapidly intensify the warming pattern that has been experienced in Canada in the past century. According to these models, by 2050 central and northern Canada will warm by as much as 5°C, with increases of 3–4°C projected for western coastlines. Even greater warming is projected for the Arctic, but slower warming is expected on the Atlantic coast. The rest of the country could experience warming in the 3–5°C range. Overall warming projections to the year 2100 from these models are outlined below.

Figure 1.2: Global Warming projections to 2100 from the Canadian coupled Global Climate Model



(Source: Canadian Climate Program Board[2])

Such changes would have profound impacts on the Canadian landscape. For example, it is estimated that increasing temperatures could move the climate suitable for the treeline significantly northward during the 21st century. It is further estimated that for every 1° C increase in water temperature, the habitat for many ocean fish species shifts poleward by approximately 150 km. The frequency and intensity of severe weather events are projected to increase in all areas of the country, as are heat waves, leading to higher incidences of smog in large urban centres such as Montréal, Toronto and Vancouver.

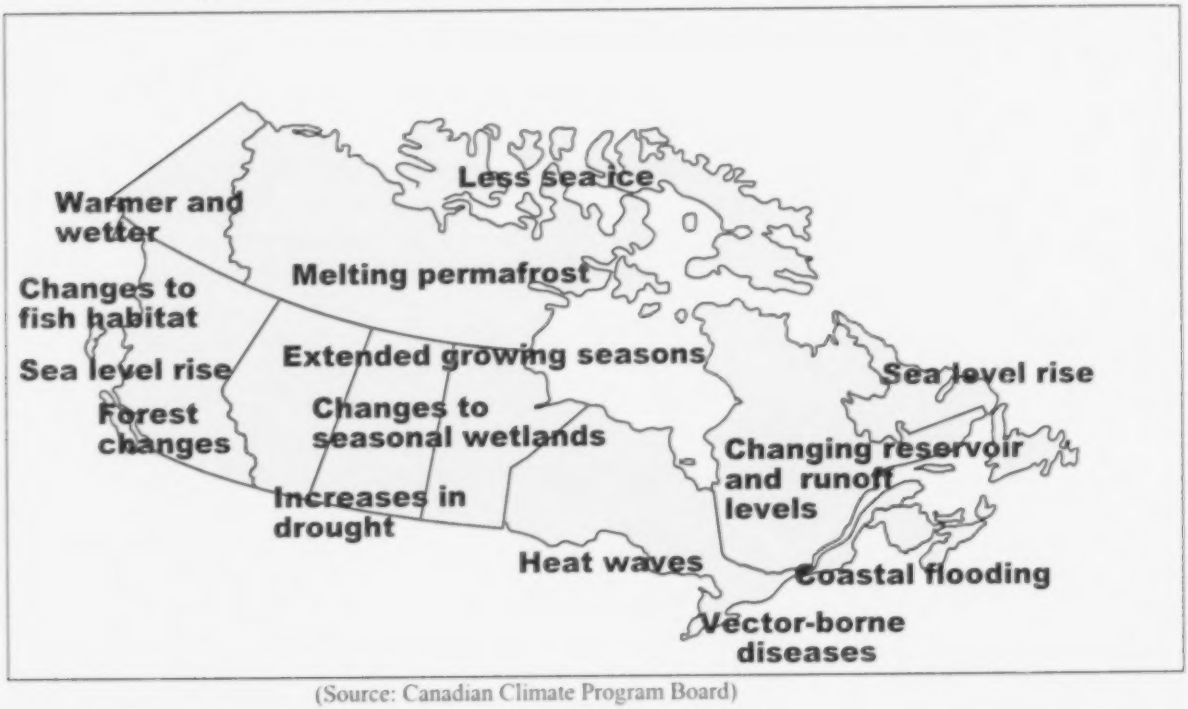
Research also suggests that Canada is particularly vulnerable to extreme weather events. Increases in the frequency and intensity of these events could have serious impacts on natural resources and infrastructure across the country, with related implications for the insurance industry and associated public sectors. These impacts are likely to be severe in the North, where melting permafrost could put major structures such as buildings and pipelines at risk.

Climate change impacts will vary in different regions of Canada, necessitating the development of flexible and varied responses across the country. While regional and local impacts remain extremely difficult to project given current modelling and observation

[2] Taken from *Understanding and Adapting to Climate Change: A Canadian Perspective*. Foundation Paper — Climate Change Science, Impacts and Adaptation. Canada's National Implementation Strategy, Canadian Climate Program Board, November 1998.

capacity, Canadian studies such as the Canada Country Study have summarized a range of potential regional impacts for Canada, which are outlined below.

Figure 1.3: Regional variations in climate change impacts



(Source: Canadian Climate Program Board)

According to Canadian research, reduced soil moisture is a particular concern for the Prairies, which are projected to undergo the greatest warming and associated soil moisture changes in the country. This in turn could adversely affect the agricultural sector, reducing crop yields.

Temperature increases in Western Canada could shift treelines and sparselytreed transition zones northward, although this expansion may be limited by the ability of species to migrate. Warmer and drier conditions are also likely to bring about greater pest infestations and increase the number of forest fires. In northern communities, issues of particular concern include increased landslides and sinking of terrain, with increased permafrost thaw projected beneath buildings, utility systems, roads, railroads, pipelines, dams and dykes.

Climate change is also projected to affect the hydrological cycle in some regions, both in terms of water quantity and quality. For example, water flows between the Great Lakes may decrease by as much as 20% by the year 2050. However, demand along the Great Lakes for water for electricity generation as well as municipal and agricultural uses will continue to increase with population growth.

Canadian Contribution to Climate Science, Impacts and Adaptation

The study of climate science, impacts and adaptation plays a critical role in informing decision-makers of the potential impacts of climate change across the country. This information underpins Canada's climate change strategy by enabling governments to adopt a risk-management approach to mitigation and adaptation.

Canadian science has also played an essential role in informing some of the international conclusions described above. Canada's contribution to climate science includes developing and running climate models to determine potential future climate changes, observing and tracking climate trends and variations in Canada, and participating in international scientific programs such as the IPCC.

Impacts and adaptation research has identified some of the vulnerabilities to climate change of Canada's sectors and regions.

Additional research in a variety of areas is being supported through a number of initiatives. For example, the federal Climate Change Action Fund, which supports research in the study of climate science, impacts and adaptation, was recently renewed until 2003. In addition, the federal government recently allocated $60 million to the Canadian Foundation for Climate and Atmospheric Sciences, which will build scientific capacity and encourage collaborative research with universities across Canada. . For the next six years, this new foundation will provide research grants for Canadian scientists to strengthen and maintain Canada's research capacity in climate-related fields, and in the areas of air quality and severe weather.

Domestic Responses to Climate Change

The assessment of potential impacts of climate change across the country informs the work of policy-makers to develop an effective risk-management strategy.

Responding to climate change is challenging for decision-makers. A number of areas of scientific uncertainty remain with respect to climate change, such as the rate of change and particular regional changes. At the same time, climate change could result in irreversible damage to the global climate and the ecosystems it supports. Long planning horizons and long time lags between emissions and potential effects further complicate this challenge.[3]

An effective risk-management approach to climate change involves several elements, including mitigation and adaptation measures. Mitigation means reducing or eliminating human influences on the climate, primarily by reducing greenhouse gas emissions. Adaptation in this context refers to actions required to adjust to future changes in the climate, to both minimize negative impacts and take advantage of new opportunities.[4]

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[3] *IPCC Second Assessment Report*, Article 1.9

[4] Definitions are drawn from *Prairie Climate Adaptation: Public Outreach Workshop Backgrounder*, March 1999

Need for Adaptation

Although the greenhouse gas reduction commitments undertaken by developed countries under the Kyoto Protocol represent a step in reducing greenhouse gas emissions, they will only slow the rate at which atmospheric concentrations of greenhouse gases will double. It therefore appears likely that some impacts from climate change will be felt globally. As a result, the international community has emphasized the importance of preparing to adapt to climate change, in addition to reducing emissions to mitigate its effects.

To adapt, Canada needs to take steps to reduce its environmental and socio-economic vulnerability and to maximize opportunities associated with climate change. Adaptation encompasses both scientific research and measures to reduce or avoid the negative impacts of climate change. Early planning involving both communities and industry will be essential.

Adaptation measures range from acting to reduce vulnerability to climate change to stopping activities that are not sustainable under the changed climate or moving particular activities or systems. Key adaptation measures from a Canadian perspective are likely to include water conservation measures (to adapt to reduced water availability and changing energy supply and demand), emergency preparedness and response, and future-oriented reviews of building and land use standards, codes and regulations.

Ongoing Science, Impacts and Adaptation Needs

Responding to climate change will require ongoing scientific efforts to understand what is happening to the climate, how it operates, our vulnerability to climatic changes, and what kinds of mitigation and adaptation measures are necessary. Uncertainties currently remain regarding the impacts, magnitude and timing of climate change.

Ongoing research is important to:

- enhance our capacity to understand and make projections of the climate and anticipate future impacts on Canadians and its socio-economic and environmental systems;
- identify critical thresholds in our climate-sensitive systems;
- prepare Canadians to reduce their exposure to risks from climate change, and provide them with information to make wise choices regarding emission reductions and adaptation measures;
- make a contribution to global efforts aimed at understanding the climate, its future evolution and possible impacts; and
- meet Canada's United Nations *Framework Convention on Climate Change* and Kyoto Protocol commitments with respect to systematic observations, climate research, and impact and adaptation studies.

An effective domestic science, impacts and adaptation strategy to support the ongoing elaboration of the national implementation process on climate change needs to address:

- systematic observations to monitor the climate;

- research to better understand how the climate system operates;
- improved measurement and reporting of greenhouse gases emitted, stored and sequestered;
- research into the behaviour of carbon sources and sinks (as well as the potential of Canada's carbon sinks);
- research on the sensitivities to climate change in our human, natural and socio-economic systems, including the identification of critical thresholds and our current capacity to adapt; and
- the development of adaptation response strategies.

In addition, the results of these programs must be communicated clearly to the public and shared with the international community. It is vital that Canadians understand the science of climate change, both in terms of what is known and what is unknown.

CANADA'S NATIONAL IMPLEMENTATION STRATEGY ON CLIMATE CHANGE

ANNEX 2 INTERNATIONAL CONTEXT

Two key factors influence the development of Canada's national implementation strategy on climate change. The scientific evidence alone provides a powerful rationale for both domestic and international action. Moreover, because climate change is a global issue, managing the risks associated with it demands a global framework for action that encourages effective domestic action.

Efforts to effectively respond to climate change are complicated by several factors, including uncertainty about the rate of climate change and its impact, the irreversibility of its effects and the considerable time lag between greenhouse gas emissions and their effects. These factors all point to the need for a precautionary approach and the adoption of preventive measures as well as measures designed to minimize the damage. This requires an effective risk management strategy that includes actions to *mitigate* the effects of climate change (including both emission reduction measures and activities to enhance carbon sinks) as well as measures that promote *adaptation*.

However, implementing such a risk-management approach poses particular challenges to policy- and decision-makers because nations and regions do not contribute uniformly to global greenhouse gas emissions, nor will they be uniformly affected by its impact.

Addressing climate change also goes to the very heart of most modern economies — namely, how we produce and use energy. Therefore, in addition to considering how climate change will affect them, nations must also carefully assess the impact of potential abatement measures on their economic infrastructure and international competitiveness. Canada, for example, must take into account how its major trading partners, particularly the United States, will respond. Remaining competitive is therefore an essential component of Canada's risk management strategy for climate change.

The purpose of this document is to provide an overview of key aspects of the international climate change debate. This includes the international negotiations surrounding the United Nations *Framework Convention on Climate Change* and Kyoto Protocol, as well as some of the outstanding issues on the international agenda, including the likely directions of the negotiations over the next few years.

Brief History of the UN Framework Convention on Climate Change

International action on climate change has developed relatively quickly in the last 30 years. The United Nations Conference on the Human Environment, held in Stockholm in 1972, was the first international meeting to identify human-induced climate change as a pressing global issue.

Governments first translated this concern into calls for greenhouse gas emission reductions in 1988. At the Toronto Conference on the Changing Atmosphere in 1998, scientists and policymakers from 46 countries recommended that CO_2 emissions be cut by 20 percent from 1988 levels by the year 2005. The Intergovernmental Panel on Climate Change (IPCC) was established that same year to assess the state of scientific research on climate change and its potential effects.

The IPCC's first scientific assessment in 1990 launched the first formal negotiations toward an international agreement on climate change. The *United Nations Framework Convention on Climate Change* was subsequently signed by 154 nations at the1992 United Nations Conference on Environment and Development in Rio de Janeiro (also known as the Earth Summit).

United Nations Framework Convention on Climate Change

The overall objective of the Convention is to stabilize atmospheric concentrations of greenhouse gases at a level that prevents "dangerous anthropogenic interference with the climate system."[1] The Convention further states that this level should be "achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner."

As a first step toward this goal, and in accordance with the principle that the Parties should take action on the basis of their "common but differentiated" responsibilities and capacities, developed country Parties agreed to aim to stabilize their greenhouse gas emissions at 1990 levels by the year 2000. The Convention also called on these countries to provide "new and additional" financial resources, as well as access to new technologies, to developing countries, particularly those most vulnerable to the adverse effects of climate change.

The Convention also makes provision for a formal review of the adequacy of commitments at the first Conference of the Parties. In 1995, governments therefore examined the IPCC's *Second Assessment Report*, which included the consensus statement that "the balance of evidence suggests that there is a discernible human influence on global climate."

Based largely on the IPCC's findings, the Parties concluded that the existing stabilization commitment was not adequate to meet the ultimate objective of the Convention. They further agreed to begin a process to negotiate new commitments for the post-2000 period, including the strengthening of emission reduction commitments by developed countries through the adoption of a protocol or other legal instrument. The negotiations that followed ultimately resulted in the Kyoto Protocol, signed at the Third Conference of the Parties in December 1997.

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d[1] Article 2, 1992 United Nations Framework Convention on Climate Change

Kyoto Protocol

The core elements of the Kyoto Protocol are consistent with the provisions of the Convention. For example, the Protocol is based on the key principles of the Convention, including the notion of common but differentiated commitments between developed and developing countries. Both instruments also call on the Parties to develop national programs to address climate change, carry out technology transfer and provide new and additional resources to developing countries, and promote and develop education and training programs.

Article 3 of the Kyoto Protocol commits developed countries to collectively reduce their emissions of six greenhouse gases by a total of 5.2 percent by the period 2008 to 2012. The Parties are required to make "demonstrable progress" toward achieving this commitment by 2005. The Parties may enhance their carbon sinks as part of their efforts to meet this commitment; however, this provision is currently limited to direct human-induced land-use change and forestry activities.

The entry into force of provisions of the Protocol stipulate that 55 Parties representing 55 percent of 1990 Annex I CO_2 emissions must ratify the Protocol before it comes into effect. This provision was meant to ensure that participating Parties would not be legally bound to fulfill the terms of the Protocol before their major trading partners did. At present, 84 countries have signed and 22 developing countries and small island states have ratified the Kyoto Protocol.

Kyoto Mechanisms

One of the most important aspects of the Kyoto Protocol from a Canadian perspective is the inclusion of three Kyoto mechanisms. These mechanisms were an intrinsic part of the final deal in Kyoto. In the final session, several countries, including the United States, Canada and Japan, secured acceptance of the mechanisms by self-imposing more stringent reduction commitments.

The primary function of these mechanisms is to assist Annex I Parties in achieving compliance with their commitments under the Protocol. These mechanisms include:

- **Joint Implementation**, which allows any Annex I Party to transfer to, or acquire from, any other such Party emission reduction units resulting from projects aimed at reducing greenhouse gas emissions at source or enhancing anthropogenic removals by sinks;
- **Clean Development Mechanism** (CDM), which allows certified emission reductions resulting from sustainable development projects in developing countries to be funded by Annex I Parties to meet part of their Article 3 objectives; and
- **Emissions Trading**, which allows Annex I Parties to fulfill their obligations under Article 3 by buying and selling emission reduction credits.

While each of these mechanisms is designed to maximize the cost-effective implementation of the Protocol, there are significant differences between the three mechanisms. For example, the CDM is the only Kyoto mechanism that explicitly involves both developed and developing countries, and is the only one that generates tangible reduction units between 2000 and the first budget period of 2008–2012.

The further elaboration and design of all three of these mechanisms forms the core of the post-Kyoto international negotiating agenda. Key issues requiring resolution before the Protocol comes into force include:

- **Supplementarity**, which refers to the Protocol requirement that emissions trading and joint implementation shall be "supplemental to domestic actions;"
- **Liability**, which refers to how responsibility will be determined **and the form that remedies will take** if a seller fails to deliver on anticipated reductions;
- **Fungibility**, which refers to whether or not certified emission reductions from CDM projects and emission reduction units from joint implementation projects may be traded within the international emission trading system; and
- **The Participation of Legal Entities**, such as the private sector.

Each of these issues will need to be resolved before the mechanisms take effect. As the Protocol anticipates that the Parties will begin banking certified emission reductions from the CDM as early as this year, early resolution of CDM-related questions in particular is essential.

International Players and Negotiating Dynamics

The positions taken by particular blocs in the climate change negotiations differ significantly. This reflects significant differences in circumstances among the various nations and regions, including their basic geography, climate, and political and economic structures. Chief among these differences is the degree of national economic dependency on the extraction, production, or intensive use of fossil fuels. Equally important is how various countries address environmental issues, particularly how greatly they rely on regulatory, economic or voluntary measures.

Other factors influencing the positions taken by different Parties include their vulnerability to the effects of climate change, their relative contribution to global greenhouse gas emissions and the range of domestic opportunities available to them. For example, the United States was the greatest producer of CO_2 emissions, with 24 percent of energy-related global emissions in 1997, making its full participation in emission reduction activities essential to the ultimate success of the Convention.[3]

At the same time, however, developing country emissions are expected to rise exponentially in the next 20 to 30 years. The International Energy Agency estimates that energy-related CO_2 emissions from developing countries will rise from 5.9 billion tonnes

[3] Source: International Energy Agency, 1998.

in 1990 to 13.5 billion tonnes in 2010.[4] Developing country emissions are also expected to account for nearly 50 percent of global industrial CO_2 emissions by 2010, up from one third in 1996. China's emissions alone are expected to double by 2010.

These factors have contributed to the emergence of several negotiating blocs in the last decade. These blocs include:

- the **Alliance of Small Island States**, representing the interests of small, mostly island states, which are particularly vulnerable to the adverse effects of climate change, especially the rise in sea level;
- the **Group of 77 (G-77) and China**, representing developing countries that want to ensure that their economic and social development won't be hampered by efforts to address climate change;
- the **European Union (EU)**, which has traditionally advocated significant emission reduction targets, reflecting the fact that European economies generally rely far less than other OECD members do on industrial sectors (e.g., oil and gas) most affected by climate change abatement policies; and
- the **Umbrella Group**, which includes non-EU members of the OECD, as well as Russia and the Ukraine. This group acts as both a negotiating bloc and a potential emissions-trading bloc.

New potential alliances between countries will likely continue to emerge in the post-Kyoto period. For example, several South American countries, led by Argentina, have begun to demonstrate considerable interest in exploring how they can maximize their participation in the Kyoto mechanisms, thus increasing investment flows to their countries. As part of this exploration, Argentina announced in November 1998 that they intend to adopt a voluntary emission limitation commitment, which could give them preferential access to the mechanisms.

Key Issues in the International Negotiations

Several major issues have influenced international climate change negotiations since they started. One such area is often referred to as the "equity debate." It refers to the attribution of responsibility or the burden-sharing arrangement adopted by the Parties in reducing emissions. Developing countries advocate a formula based on historical contributions to atmospheric CO_2 concentrations, whereas developed countries have traditionally wished to see more universal efforts to reduce emissions.

In addition, ongoing negotiations are influenced by concerns about the potential impact of mitigation measures on the international trade and competitiveness of individual countries or regions. Some countries (including Australia, Canada and the United States) are concerned that the dearth of commitments by developing countries could undermine the international competitiveness of their domestic industries.

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[4] International Energy Agency, *Energy Environment Update*, No. 6, August 1997.

A related concern is that of "carbon leakage." Leakage refers to emission increases in countries that have not adopted reduction commitments (i.e., developing countries), increases caused by the relocation of energy-intensive industries to these countries. This type of emission relocation could also occur if energy-intensive industries in developing countries expand output and emissions through a newly created comparative advantage.

The issue of developing country commitments remained contentious during the negotiation of the Kyoto Protocol. Based on both trade and competitiveness concerns, as well as the fact that emissions from developing countries are expected to grow exponentially over the next 20 years, several developed countries advocated for the Protocol to include a process to examine and negotiate non-Annex I emission limitations. The United States in particular, responding to pressure from the U.S. Senate, lobbied for "meaningful participation" by developing countries in the Protocol.

This issue was not resolved in Kyoto and remains the most divisive of all the issues in the Convention. It promises to be a major area of debate in future negotiations. The resolution of this question will be critical to the ultimate success of both the Convention and the Protocol.

Implementation Strategies

Annex I Parties have adopted significantly different approaches to implementing their commitments under the Convention. As indicated above, this reflects such factors as geographic circumstances, the structure of each country's domestic economy (and associated international competitiveness considerations), and the existing regulatory regimes or policy preferences in play in each country.

Uncertainties remain with respect to the key provisions of the Protocol, including guidelines and modalities associated with the Kyoto mechanisms, as well as the extent to which carbon sink enhancements may be used by the Parties to fulfill their commitments. There are a number of Annex I countries who have adopted National Action Plans (such as France, Australia, Iceland, Italy, Netherlands, Norway) while Great Britain and Germany have proposed draft National Action Plan with a view to finalizing these plans in the coming year (for Germany, the draft proposal has been postponed until 2001). As the measures proposed so far through the National Action Plans are not yet fully implemented, these do not guarantee that countries will meet their targets without making greater use of the Kyoto Mechanisms than anticipated in their strategies.

It is likely that most Umbrella Group members intend to optimize their use of the Kyoto mechanisms in meeting their commitments In addition, interest in using the mechanisms appears to be growing among EU member states, particularly the United Kingdom and Germany. Canada has expressed its intention to achieve the majority of its reduction through domestic actions.

Domestic approaches vary widely. Germany, for example, has focused its efforts to date on both regulatory initiatives and ecological tax reform. In contrast, Australia, with its

energy-intensive economy, is focusing on voluntary partnership-based initiatives, supplemented by improved fuel efficiency and alternative fuels programs, as well as significant investments in enhanced carbon sequestration. The United States anticipates a strong role for domestic emissions trading and has also introduced a series of research and development activities and financial incentives.

The United Kingdom is among the few countries that are on track to meeting their target. Its draft National Action Plan is to be finalized by the end of 2000. It includes a climate change levy, a goal to increase renewables 10 percent in 2010, domestic emissions trading, improving the transport system, energy efficiency schemes for homes and a major public education and outreach campaign. France has announced its national plan in January 2000 proposing some 96 domestic measures which focus on a carbon tax, improving the transport system, afforestation and reforestation, and increasing the use of renewable energy.

Countries are already engaged in international projects. A survey of Activities Implemented Jointly (AIJ) projects already implemented by some of Canada's competitors reveals that the United States has 44 projects, Japan 37, the Netherlands has 26, Australia has 7 and Sweden has over 40 such projects. The first full year in Canada's CDM & JI Office has led Canada's first 4 AIJ project reviews, along with technical assistance on approximately 10 projects in different stages of development.

Canadian efforts to address climate change to date have been shaped by our national circumstances, including our geography and cold climate, as well as the energy-intensive and highly regional nature of our economy. Canada's actions to date emphasize voluntary approaches to reducing greenhouse gas emissions.

The Path Forward

Climate change is a long-term issue. Although the international community is working to reduce emissions and enhance carbon sinks by 2008 to 2012, addressing climate change will remain a challenge long after the first deadline. Future action will continue to be guided by the ultimate objectives of the Convention.

In the short term, several Kyoto Protocol issues will need to be resolved before the Protocol can take effect. Some of them were identified at the fourth Conference of the Parties and form the framework for international climate change negotiations leading up to the sixth Conference of the Parties (COP6) in November 2000. Key issues include the elaboration of the Kyoto mechanisms, the inclusion and calculation of carbon sinks under the Protocol, and the development of a compliance regime for the agreement.

A core element of the COP6 agenda relates to elaboration and implementation of the Kyoto mechanisms. In general, the primary objective for members of the Umbrella Group (including Canada) in post-Kyoto discussions is to ensure that the international mechanisms are simply designed, attractive to the private sector and become operational

as soon as possible. The Umbrella Group is also opposed to any limits on the use of these mechanisms.

The EU, supported by the G-77 and China, wants stringent requirements placed on the mechanisms to ensure that the mechanisms do not create "loopholes" in the Protocol. This reflects concerns about both the environmental effectiveness of the mechanisms and trade competitiveness. The EU has also stated its opposition to "hot air" trading[5] and continues to call for conditions on the mechanisms, such as a proposal that the compliance regime for the Protocol as a whole be in place before the mechanisms take effect.

The inclusion and calculation of carbon sinks under the Protocol will also be subject to intense discussion and negotiation in the lead-up to COP6. The central challenge will be to establish eligibility criteria for sinks under the Protocol. For example, it will be necessary to determine whether agricultural soils and forestry management may be counted as sinks, as well as the extent to which they should be fully credited in the first commitment period. Even within traditional negotiating blocs like the G-77, countries remain divided on these questions.

The development of a compliance regime for the agreement will also be a key component on the international agenda. Compliance encompasses a broad spectrum of issues, including the rules that govern the conduct of the Parties, the technical assessment of a Party's efforts to implement and report on its activities, legal assessment of non-compliance and the consequences associated with such a determination. The compliance regime is a key element of the overall legal framework for action on climate change. As such, it forms an important part of upcoming international negotiations, including those leading to COP6 and beyond.

While the question of developing country engagement is not formally part of the negotiations to COP6, it is nevertheless critical to the future evolution of the Protocol and the Convention. The United States has stated the need to secure "meaningful" participation by these countries in the Protocol prior to its ratification. Other countries, including Canada, have indicated the importance of developing countries taking on emission reduction commitments in the future. The exploration of so-called voluntary commitments by such countries as Argentina and Kazakhstan offers one possible solution to this question, although progress in elaborating these commitments has been slow.

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[5]Hot air refers to emission credits derived when a Party assumes a target which is higher than its current emission projections (for example, Russia's commitment to stabilize their emissions at 1990 levels by 2010, despite the fact that their 1995 emissions were 32 percent lower than these levels. These allowances could potentially be sold on the international trading market.

As a global issue, climate change requires effective and collaborative international responses. The international dimensions of the climate change debate inform Canada's domestic response, just as our national circumstances inform our strategies and positions in international negotiations. As a result, careful consideration of this international context is essential to the development of Canada's national implementation strategy on climate change.

The European Union, Japan, and many developing countries are pushing for ratification by 2002, which coincides with the 10th Anniversary of the Rio Conference which saw the negotiation of the UNFCCC.

As Canada's most important trading partner, the response of the United States to the climate change challenge will be particularly important. The actions - or non-actions - of the United States could have profound effects on Canada's international competitiveness. It is therefore essential that Canada's implementation strategy carefully consider the likelihood that the United States will ratify or implement the Protocol.

CANADA'S NATIONAL IMPLEMENTATION STRATEGY ON CLIMATE CHANGE

ANNEX 3
DOMESTIC CONTEXT FOR ACTION ON CLIMATE CHANGE

Several factors influence and inform the development of domestic responses to climate change. One is the science of climate change, which offers compelling projections that Canada and the rest of the world will be adversely affected by increased atmospheric concentrations of greenhouse gas emissions. This has provided a powerful rationale for both international and domestic action to mitigate and adapt to the potential impacts of climate change. International trade and competitiveness considerations also underline the importance of a global framework for actions to address climate change.

Canada's national circumstances also influence our response to climate change. These circumstances are not uniform throughout Canada, and may vary significantly from region to region. Understanding this variance is critical to the development and evolution of the national implementation strategy on climate change.

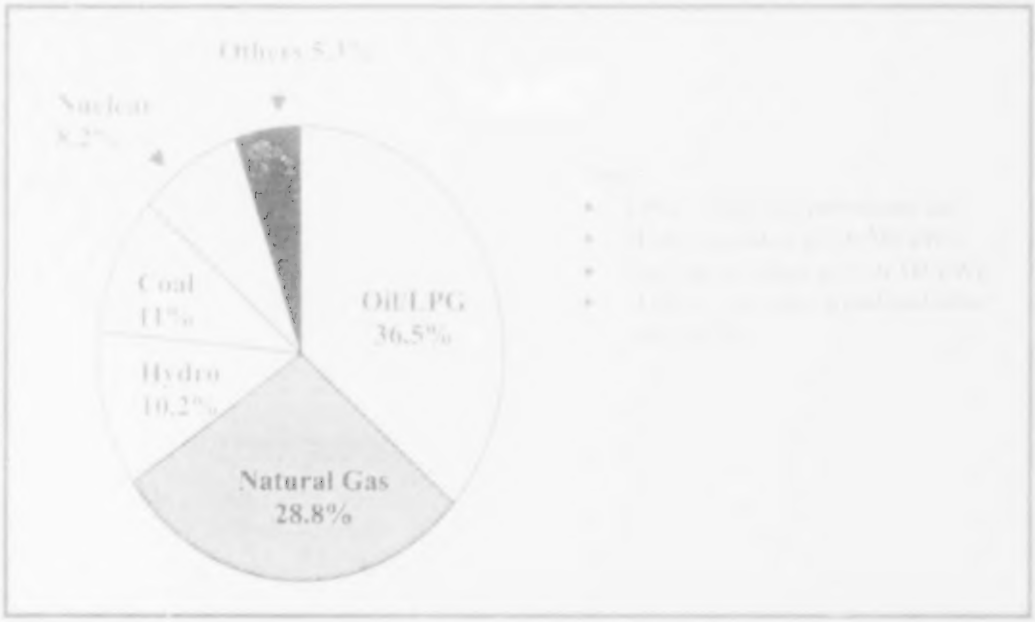
The purpose of this summary is to outline the Canadian context for addressing climate change. This includes Canada's national circumstances, as well as its greenhouse gas emissions profile. This document also provides an overview of action on climate change in Canada to date, and summarizes the key elements of the national implementation process established by the First Ministers in December 1997.

Canada's National Circumstances

Canada's national circumstances include our vulnerability as a northern country to the potential impacts of climate change. At the same time, Canada's climate of extremes of cold and hot weather, large land mass, relatively high population growth rate, and many resource-based energy-intensive industries all contribute to high energy use and demand, which in turn produces relatively high levels of greenhouse gas emissions.

These factors underline the importance of a response strategy that incorporates both mitigation and adaptation measures. The strategy must also account for the uneven distribution of anticipated climate-related damages and mitigation costs among regions of the country and sectors of the economy.

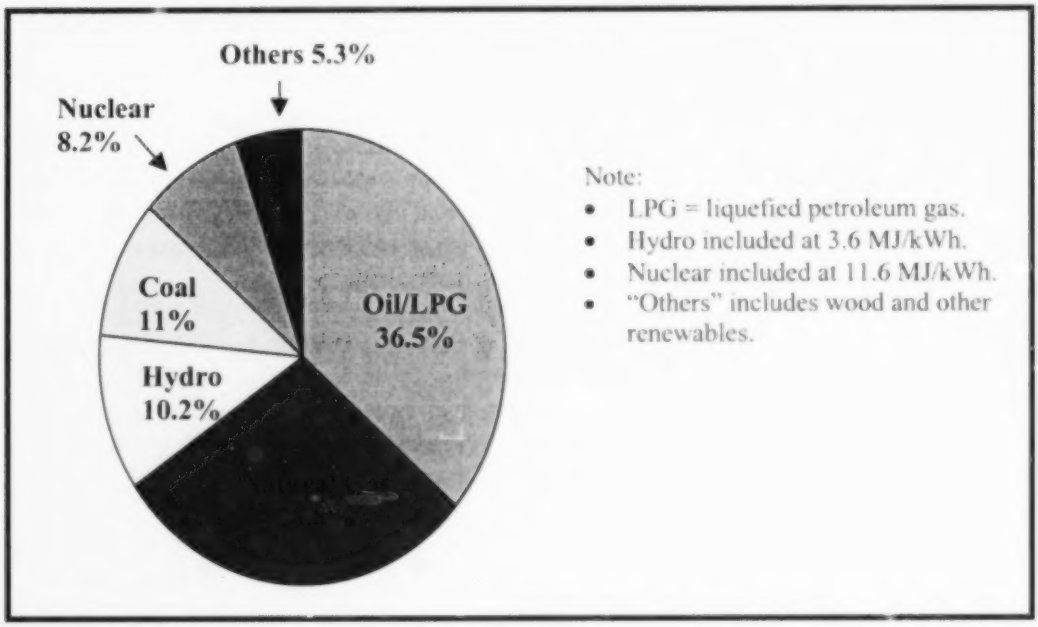
The extent of projected economic growth in Canada is another facet of our domestic context. While Canadian industry has lessened its energy intensity in recent years, the growth in demand for products has overwhelmed associated emission reductions. Energy intensity reductions would have to continue at almost twice the current rate to keep up with this increase in the volume of production.


Others 5.1%
Nuclear
8.2%
Coal
11%
Hydro
10.2%
Oil/LPG
36.5%
Natural Gas
28.8%

In addition, the Canadian economy includes a large proportion of energy-intensive commodity industries and relies heavily on international trade. Six energy-intensive industries — pulp and paper, iron and steel, smelting and refining, chemicals, petroleum refining, and cement — account for 60 percent of industrial energy demand.

Other sectors of the Canadian economy also use significant levels of energy. Much of this energy demand is for oil and liquefied petroleum gas (36.5 percent), followed by natural gas (28.8 percent).

Figure 3.1 Canadian Energy Demand by Fuel Type, 1997



(Source: Natural Resources Canada, 1999)

In addition, the Canadian economy is highly export-intensive. Exports currently comprise more than 40 percent of Canada's GDP. On a sectoral basis, Canadian exports have diversified in recent years, and now include a larger portion of higher value-added products. However, 40 percent of Canada's exports are still energy-intensive, resource-based commodities. How mitigative responses to climate change could affect Canada's competitiveness is therefore an important consideration.

Canada is also heavily reliant on the United States as a trading partner. The U.S. share of Canadian exports grew from 71 percent in 1991 to 78 percent in 1997. Much of Canada's export growth in the 1990s was fueled by American demand for Canadian products such as natural gas, which play an important and likely increasing role in helping the United States reduce its emissions. Given its role as Canada's primary trading partner, the U.S. approach to addressing climate change is of particular importance to Canada's national strategy.

At the same time, there are significant private opportunities and public benefits associated with actions to address climate change. For example, with annual sales of $14 billion, Canada's environmental technologies industry is one of the fastest-growing sectors of the economy. Areas where Canada has particular strength include a range of energy efficiency technologies, the collection and use of landfill gas, and alternative power generation. These technologies also offer ancillary benefits, as they reduce pollutants such as nitrogen oxides (NO_x) and particulate matter.

Canada has significant geological potential for carbon dioxide (CO_2) sequestration, both in aquifers and in enhanced oil recovery in the Western Sedimentary Basin. In addition, Canada's forests and soils act as valuable carbon sinks and may offer additional opportunities for carbon sequestration. Although questions remain regarding the eligibility and measurement of sinks under the Kyoto Protocol, this is nevertheless an area of potential strength for Canada.

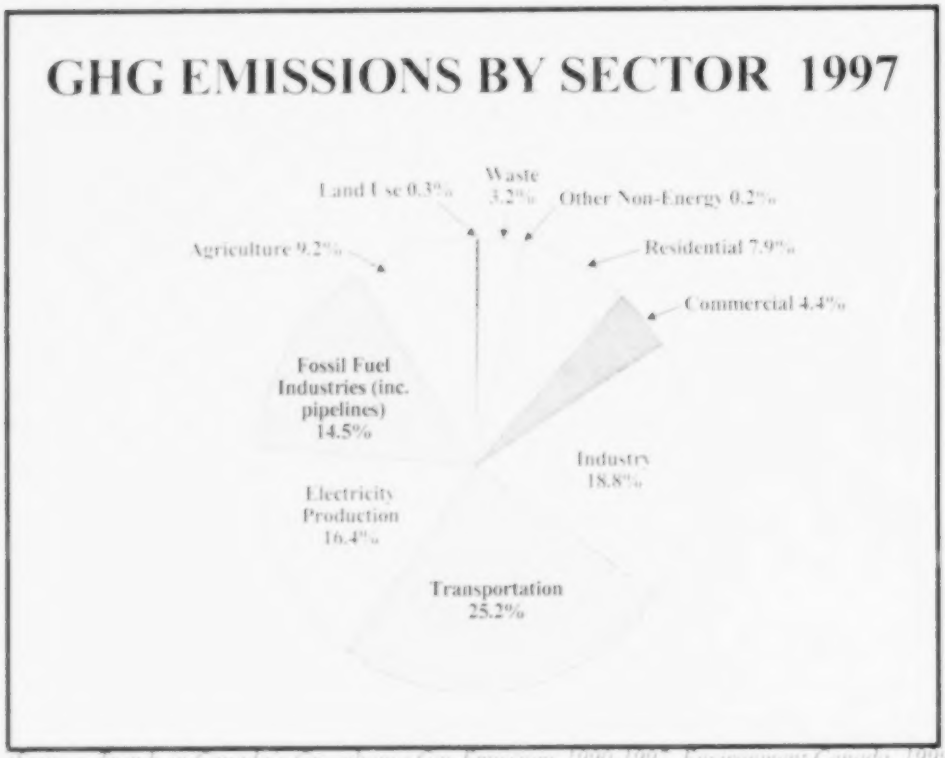
Emissions Profile

Canada's total greenhouse gas emissions in 1997 were 682 million tonnes (or about 2 percent of global emissions). Of the six greenhouse gases covered by the Kyoto Protocol, CO_2 was the greatest contributor to Canada's total emissions in 1997, representing 76 percent of total emissions.

Energy production, transmission and use are the largest sources of greenhouse gas emissions in Canada. Energy-related emissions account for approximately 79 percent of total emissions. This total includes all fossil fuel combustion activities, including electricity generation, industrial processes and transport.

On a sectoral basis, transportation was the top contributor to greenhouse gas emissions in 1997, accounting for approximately 25 percent of Canada's total. Other key sectors included the industrial sector (19 percent), electricity generation (16 percent), fossil fuel production and distribution (15 percent), residential heating (8 percent), agricultural (9 percent), and commercial and institutional sectors (4 percent).

Figure 3.2: Canada's Greenhouse Gas Emissions by Sector (1997)



(Source: Trends in Canada's Greenhouse Gas Emissions 1990-1997, Environment Canada, 1999.)

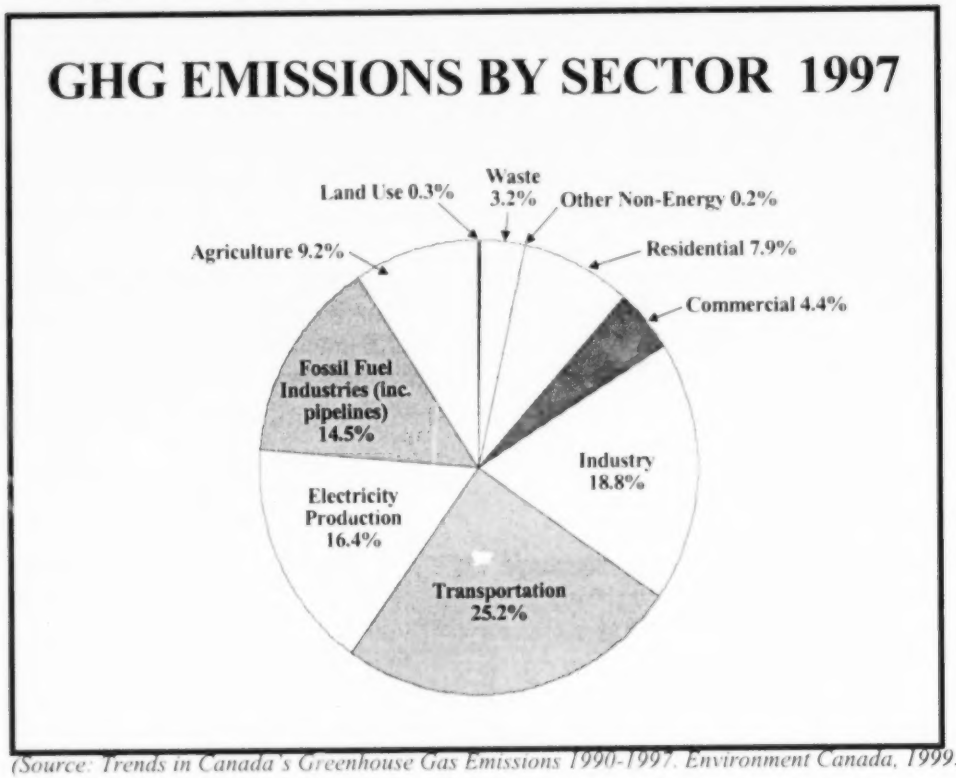
Individual Canadians, through personal transportation, home heating and electrical use, are directly responsible for about 28 percent of Canada's total emissions. This proportion is even higher if emissions from the manufacture of consumer products are included. Clearly, actions to reduce greenhouse gas emissions must involve all Canadians — as individuals, in their communities, and within governments and industry.

Emission Trends Since 1990

Canada's emissions in 1997 were 13 percent higher than 1990 levels. This is primarily a reflection of three factors: increased economic activity, population growth, and increased energy exports and consumption. Among the provinces, emissions rose most quickly during this period in Alberta, followed by British Columbia. Emissions growth in these two provinces was led by increased oil and gas production in Alberta, and transportation-related emissions in British Columbia.

In 1997, more than 50 percent of Canada's oil and natural gas production was exported to the United States. Canadian exports of oil and natural gas from 1990 to 1997 were responsible for 26 percent of Canada's total emissions growth. While advances in energy efficiency slowed the rate of emissions growth during this period, the increases in production overwhelmed efforts to limit associated emissions. Several unforeseen

Figure 3.2: Canada's Greenhouse Gas Emissions by Sector (1997)



(Source: Trends in Canada's Greenhouse Gas Emissions 1990-1997. Environment Canada, 1999.)

Individual Canadians, through personal transportation, home heating and electrical use, are directly responsible for about 28 percent of Canada's total emissions. This proportion is even higher if emissions from the manufacture of consumer products are included. Clearly, actions to reduce greenhouse gas emissions must involve all Canadians — as individuals, in their communities, and within governments and industry.

Emission Trends Since 1990

Canada's emissions in 1997 were 13 percent higher than 1990 levels. This is primarily a reflection of three factors: increased economic activity, population growth, and increased energy exports and consumption. Among the provinces, emissions rose most quickly during this period in Alberta, followed by British Columbia. Emissions growth in these two provinces was led by increased oil and gas production in Alberta, and transportation-related emissions in British Columbia.

In 1997, more than 50 percent of Canada's oil and natural gas production was exported to the United States. Canadian exports of oil and natural gas from 1990 to 1997 were responsible for 26 percent of Canada's total emissions growth. While advances in energy efficiency slowed the rate of emissions growth during this period, the increases in production overwhelmed efforts to limit associated emissions. Several unforeseen

circumstances also increased emissions during this period, such as the temporary shutdown of some nuclear reactors in Ontario in 1995.

Different sectors have experienced different levels of emissions growth since 1990, and this growth has been spurred by various factors. For example, transportation-related emissions increased by 17 percent from 1990 to 1997 because more vehicles were being driven greater distances. Since the late 1980s, improvements in the energy efficiency of personal vehicles in North America have been used mainly to increase power and weight rather than to reduce fuel consumption[1]. In addition, truck traffic has increased substantially because of NAFTA trading and the needs of minimum warehousing practices in industry. As a result, less emissive trains now carry lower proportions of freight traffic[2].

On the other hand, the energy intensity of secondary energy use in Canada has significantly improved since 1990[3]. While CO_2 emissions from secondary energy use increased by 7.2 percent between 1990 and 1996, they did so at a lower rate than initially projected because of increased energy efficiency in each end-use sector. In the absence of these improvements, CO_2 emissions would have risen by 11.4 percent during this period (or another 16.3 megatonnes)[4].

Projected Greenhouse Gas Emissions in Canada

To account for any events or circumstances that might influence Canada's future emissions profile, Natural Resources Canada produced updated projections of Canada's greenhouse gas emissions in December 1999 in cooperation with the Analysis and Modelling Group established under the national climate change process. This report can be found on the Internet at **http://www.nrcan.gc.ca/es/ceo/update.htm**.

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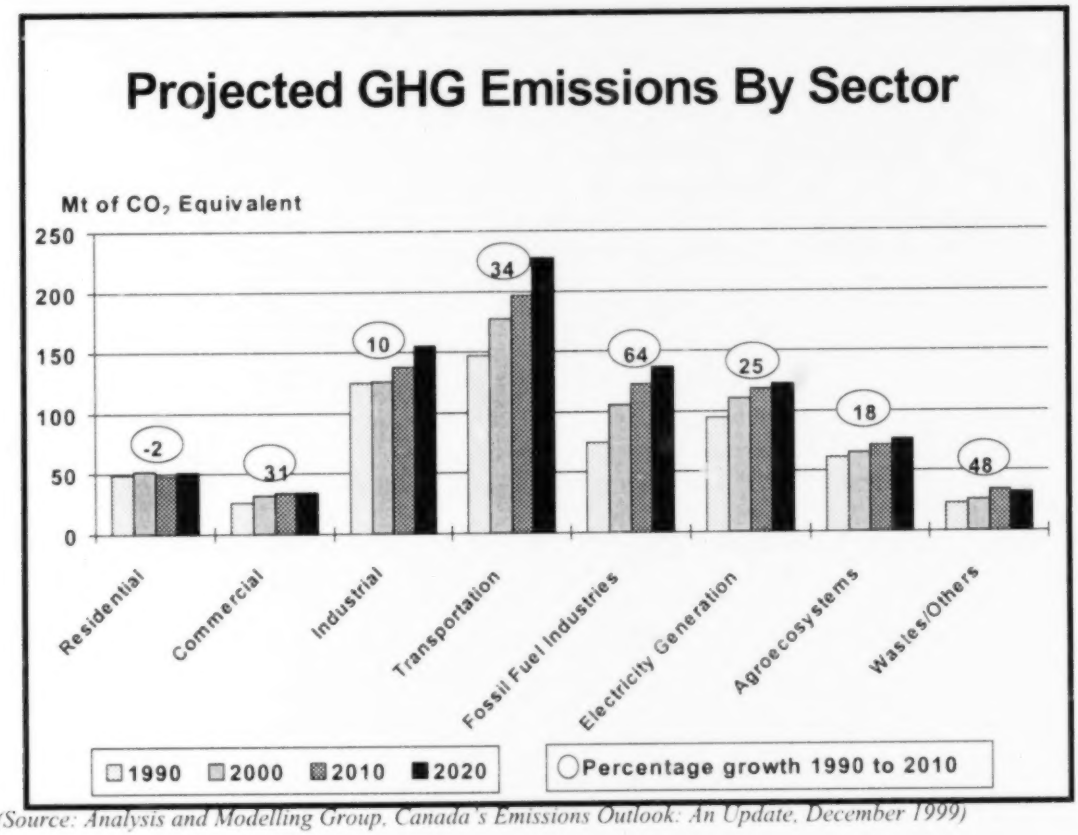
[1] Transportation and Air Quality, U.N. National Academy of Science and Royal Society of Canada, 1998.
[2] Ontario Round Table on Transportation and Climate Change, 1995.
[3] Secondary energy use refers to energy used in the transportation, industrial, residential, commercial and agricultural sectors (also known as end-use sectors).
[4] *See* Natural Resources Canada, *Energy Efficiency Trends in Canada 1990–1996: A Review of Indicators of Energy Use, Energy Efficiency and Emissions*, June 1998. This publication can be found at **http://oee.nrcan.gc.ca/general/trends/trends_e.pdf**. Other publications related to energy efficiency in Canada can be found on the NRCan Office of Energy Efficiency Web site at **http://www/oee.nrcan.gc.ca**.

Figure 3.3: Projected Business-as-Usual GHG Emissions Growth by Sector to 2010



(Source: Analysis and Modelling Group, Canada's Emissions Outlook: An Update, December 1999)

The update assumes stronger economic growth in the short term, although longer-term economic projections (2000 to 2010) are expected to remain largely the same as earlier projections. All provinces except British Columbia are expected to experience strong short-term economic growth (i.e., from 2000) from resource-based industries (in the Atlantic), higher U.S. export growth (Quebec and Ontario), and higher growth in consumer and service sectors (Alberta, Manitoba and Saskatchewan). Growth in Alberta would also be driven by anticipated oil sands developments.

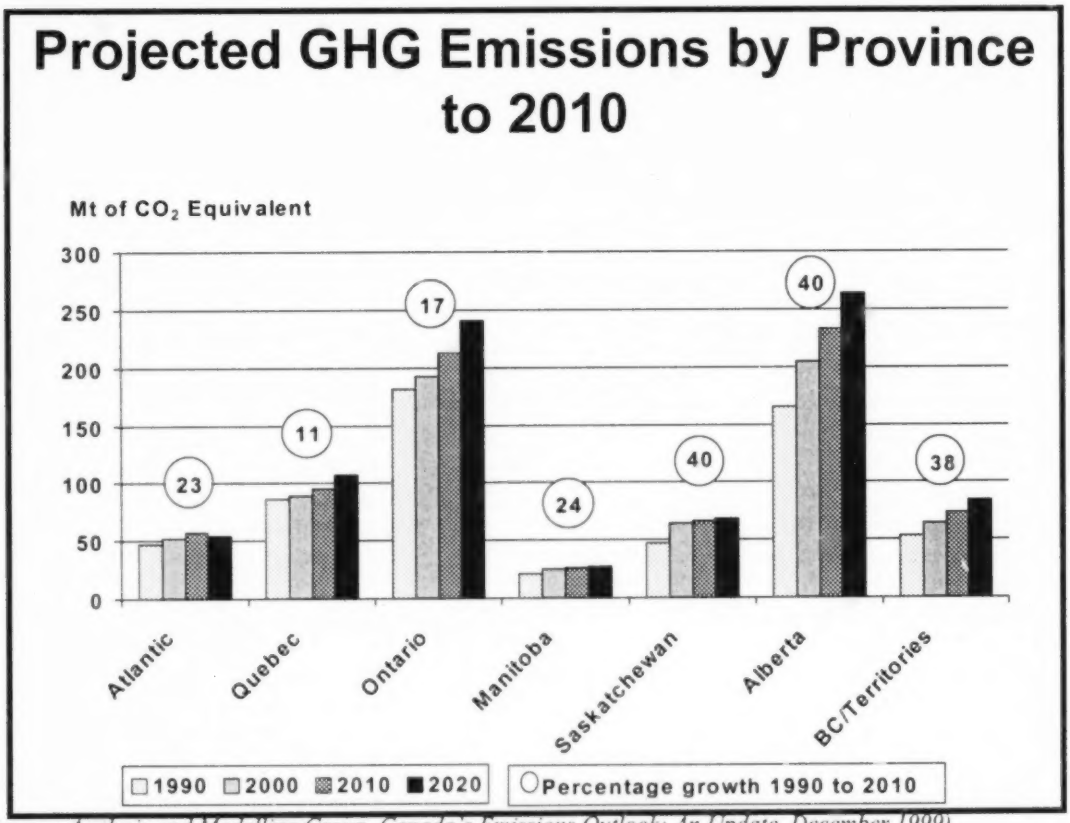
This projected economic growth is expected to result in increased estimates of emissions by 2010. According to the update, total greenhouse gas emissions are estimated to be 27 percent above 1990 levels by 2010. By 2020, if no further action is taken, emissions are expected to rise 41 percent above 1990 levels.

The most significant contributor to emissions growth is expected to be the fossil fuel industry, which is projected to increase its emissions by 64 percent between 1990 and 2010. This is largely because of increases in oil sands production to meet export demand, scheduled to occur between 2000 and 2010. Transportation-related emissions are

expected to grow by 34 percent during this period, driven by increases in air and road transport of freight and passengers.

Emission growth rates do, however, differ markedly across the country. Emissions are expected to grow most quickly in Alberta, Saskatchewan and Newfoundland (40 percent by 2010). British Columbia and New Brunswick are also projected to experience strong emissions growth, by 38 percent and 30 percent respectively. Emissions in Ontario and Quebec are expected to grow at lower rates, 17 percent and 11 percent respectively. The largest emitters by tonne are Alberta and Ontario.

Figure 3.4: Projected Business-as-Usual GHG Emissions Growth by Province to 2010



(Source: Analysis and Modelling Group, Canada's Emissions Outlook: An Update, December 1999)

Actions to Date

The development of the current national implementation strategy builds on previous steps by federal, provincial and territorial governments. The 1995 National Action Program on Climate Change (NAPCC) established the Voluntary Challenge and Registry Inc. (VCR Inc.) to encourage private and public organizations to voluntarily limit their net greenhouse gas emissions. The VCR Inc., and its Quebec counterpart, ÉcoGESte, complement the Canadian Industry Program for Energy Conservation (CIPEC), which

was established in 1975 to promote reduced energy consumption per unit of production in all Canadian industrial sectors. CIPEC has been instrumental in reducing the energy intensity of key industrial sectors in Canada.

Many governments in Canada - including municipalities - have undertaken significant initiatives to reduce emissions from their own operations. Actions by governments include energy efficiency improvements, the promotion of renewable energy and alternative energy, and the development and commercialization of climate-related technologies. All governments are also exploring options for reducing emissions from the transportation, residential, commercial and industrial sectors. A list of actions by governments to date can be found at

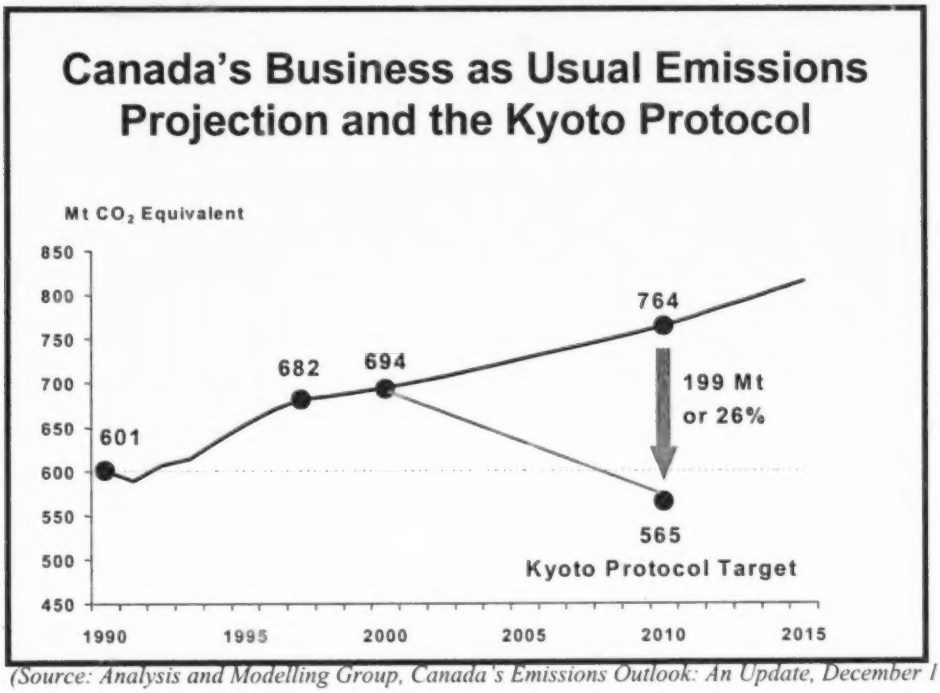
http://www.nrcan.gc.ca/communications/cc2000/html/actions_to_date.html.

Impact of Current Actions

Natural Resources Canada's December 1999 projection now estimates emissions in 2010 to be 27 percent above 1990 levels. However, NRCan also estimates that, in the absence of the NAPCC, emissions projections would be much higher – in the order 8 percent above 1990 levels in 2010, and 11 percent higher in 2020.

Canada's emission reduction commitment under the Kyoto Protocol is 6 percent below 1990 levels within the 2008–2012 period. This means that Canada's emissions limit for 2008–2012 is 565 megatonnes (Mt). To achieve this target, emissions need to be reduced by 199 Mt. This represents a gap of 26 percent between the updated projections and the Kyoto target. This will be a considerable challenge for Canada.

Figure 3.5: Estimated Emission Reductions Required to Meet Kyoto Target



(Source: Analysis and Modelling Group, Canada's Emissions Outlook: An Update, December 1999)

While this gap is significant, these projections are lower than they would have been in the absence of current initiatives. The update estimates that, without the NAPCC, the Kyoto gap would be about 30 percent higher.

Furthermore, the potential for replicating existing measures is significant. The Climate Change Action Fund, administered by the federal government, will also help engage industry, environmental groups and the public in additional activities to reduce emissions.

National Process on Climate Change

The First Ministers discussed the issue of climate change immediately after the conclusion of the Kyoto Protocol in December 1997. They agreed that climate change is an important global issue that Canada must do its part to address, although this must be done without asking any region to bear an unreasonable burden. As a result, the energy and environment ministers agreed in April 1998 to engage governments and stakeholders in a process to develop a phased national implementation strategy.

Sixteen multi-stakeholders Issue Tables were established to provide advice to governments and enable stakeholder involvement in the development of the strategy. These Tables were given a mandate to develop options for reducing greenhouse gas

emissions in different sectors, as well as to provide advice on cross-cutting issues such as public education and outreach.

In March 2000, federal, provincial and territorial ministers of energy and the environment agreed on the need for coordinated action on climate change within a national framework, while recognizing jurisdictional flexibility to meet unique regional needs, circumstances and opportunities. The ministers agreed that the national implementation strategy should both undertake immediate actions and provide ongoing analysis and decision-making on opportunities and challenges under the Kyoto Protocol.

A three-year rolling business plan approach was adopted by the ministers to implement the national implementation strategy. The ministers will meet in fall 2000 to consider an integrated package, including the national implementation strategy, a Phase One business plan, and a federal, provincial and territorial framework agreement. Themes for the Phase One business plan will include enhancing awareness and understanding, promoting technology development and innovation, investing in knowledge, governments leading by example, and encouraging action within and across all sectors.

Clearly, the challenge for Canada is considerable. Canada must develop a risk-management approach that adequately accounts for Canada's vulnerability to climate change, economic well-being and growth, and significant regional differences. At the same time, the approach must recognize and enhance the opportunities for Canada associated with efforts to address climate change. For example, overall competitiveness can be enhanced by increased efficiencies in the use of energy and in industrial processes.

The approach agreed to by the ministers in March 2000 provides a framework for the further elaboration of this strategy in the coming years. Continued understanding of Canada's changing domestic circumstances will be key to the development of this approach.

National
Climate
Change
Process